Canada's Nuclear Regulator

Final Scoping Information Document

The Proposal by Atomic Energy of Canada Limited for the National Research Universal Reactor Long-term Management Project at Chalk River Laboratories, Ontario

July 2009

CEAR 09-01-46668

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

Canada

OVERVIEW

INTRODUCTION OF PROJECT

The Canadian Nuclear Safety Commission (CNSC) has received an application from Atomic Energy of Canada Limited (AECL) to undertake a variety of projects focused on the long-term management of the National Research Universal (NRU) Reactor at Chalk River Laboratories (CRL), Ontario. The project requires the construction and installation of supporting infrastructure, as well as modifications to existing facilities to support NRU Reactor operations until 2021. The NRU Reactor is currently defueled as part of an ongoing investigation into the reactor vessel leak that occurred in May 2009. The results of this investigation may impact how AECL proceeds with this Environmental Assessment (EA).

As a result of this application, the CNSC has determined that an EA must be conducted pursuant to the *Canadian Environmental Assessment Act* (CEAA).

AECL's project is called the "National Research Universal Reactor Long-term Management Project" and it is registered in the Canadian Environmental Assessment Registry under project number 09-01-46668.

PURPOSE OF SCOPING INFORMATION DOCUMENT

The purpose of this Scoping Information Document is to:

1. Delineate the boundaries of the EA being carried out for AECL's NRU Reactor Long-term Management Project.
2. Provide AECL with project-specific guidance for the conduct of the environmental technical studies.

CONTACTS FOR THE ASSESSMENT

Anyone wishing to obtain additional information or provide comments on any aspect of the EA being conducted on the project may do so through the following CNSC staff contacts:

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1.0 BACKGROUND

1.1 Project Description

On March 27, 2009, AECL submitted a proposal to the CNSC requesting a licence renewal with amendments to enable the undertaking of a variety of projects to secure the long-term operation of the NRU Reactor until 2021. The proposal requires modifications to existing facilities and construction and installation of new supporting infrastructure. A revised project description was submitted in June 2009 (Reference 1).

To support licence renewal and continued operation of the NRU Reactor to 2021, AECL is conducting an Integrated Safety Review (ISR) of the NRU Reactor. If required, this EA will also consider the refurbishment/upgrading/replacement of any major components to ensure NRU Reactor operation until 2021.

The modifications to existing facilities include the following:

- NRU Reactor Building rod bay encapsulation;
- replacement of Molybdenum Production Facility (MPF) ventilation system; and
- connection of MPF to the active drain system.

Site preparation, construction, installation and operation of the following facilities and supporting infrastructure are also included:

- Light Water Detritiation Facility (LWDF);
- Fissile Waste Storage System (FWSS); and
- new waste management infrastructure for large items generated as a result of refurbishment/upgrading/replacement recommended by the ISR.

The new facilities will be used for the treatment and storage of waste and emissions; therefore, no changes are proposed to the way the NRU Reactor is currently operated. The purpose of the proposed project is to allow AECL to continue its activities in support of nuclear power development, isotope production, fundamental materials research and other commercial applications.

1.2 EA Determination

AECL's NRU Reactor is currently licensed under the Nuclear Research and Test Establishment Operating Licence, NRTEOL-01.04/2011. In order to perform the requested construction, installation and modifications to ensure NRU Reactor operation reliability, AECL will require amendments to the licence. Additionally, to support the long-term operation of the NRU Reactor, AECL will require a licence renewal until 2021.

The required amendments and renewal to the NRU Reactor Operating licence would be considered by the Commission under the authority set out in subsection 24(2) of the *Nuclear Safety and Control Act* (NSCA). Paragraph 24(2) of the NSCA is listed as a 'trigger' under the *Law List Regulations* of the CEAA in respect of the amendment of a licence; therefore, there is a 'trigger' for this proposal.

The physical works for this proposal are the NRU Reactor and associated infrastructure. AECL's proposal requires the construction of supporting facilities as well as modifications in relation to the physical works, thus constituting a 'project' as defined in section 2 of the CEAA.

There is both a 'project' and a 'trigger' for AECL's proposal, and the *Exclusion List Regulations* do not apply. Therefore, an EA is required to be conducted prior to the CNSC taking any licensing action. As this proposal is not listed on the *Comprehensive Study List Regulations* of the CEAA, a screening EA is required.

If the Commission concludes from the EA that the project is not likely to cause significant adverse effects, taking into account the available mitigation measures, the application would be evaluated under the provisions of the NSCA and its regulations prior to the Commission making a licensing decision on the proposal.

1.3 Project Coordination

Pursuant to the CEAA *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*, the CNSC has consulted with other federal departments to determine whether they are likely to exercise a power, function, or duty under section 5 of the CEAA and/or whether they possess expert assistance that could be used during the assessment, in accordance with subsection 12(3) of the CEAA. The CNSC is the only Responsible Authority under the CEAA identified for this screening. Health Canada (HC), Fisheries and Oceans Canada (DFO), Natural Resources Canada (NRCan) and Environment Canada (EC) have been identified as Federal Authorities for the purpose of providing expert assistance to CNSC staff during the environmental assessment.

The CNSC also consulted the Ontario Ministry of the Environment (OMOE) and the Ontario Ministry of Natural Resources (OMNR) to determine whether there are provincial EA requirements under the *Ontario Environmental Assessment Act* and other provincial legislature that are applicable to the proposal. No provincial EA is required; however, CNSC staff will keep the OMOE and OMNR informed throughout the EA process.

1.4 Delegation of Technical Studies

The CNSC, in accordance with subsection 17(1) of the CEAA, delegates to AECL the conduct of technical support studies for the environmental assessment and the preparation of an Environmental Impact Statement (EIS) report to be submitted to CNSC staff for

review. When the EIS report is accepted as satisfactory, CNSC staff will prepare a EA Screening Report and submit it to the Commission for consideration and decision.

1.5 EA Project Schedule

Pursuant to the approved process for simple screenings at the CNSC, the following steps, activities and timelines have been discussed and agreed-upon by CNSC staff, other federal authorities and the proponent. The EA Process Schedule (Table 2-1) is in accordance with the Protocol for National Research Universal Licensing Activities (Reference 2) signed July 15, 2008 by the President and Chief Executive Officers of both the CNSC (M. Binder) and AECL (H. MacDiarmid).

Table 2-1 EA Process Schedule

Project Milestone	Responsibility	Date
Preparation of draft Scoping Information Document	CNSC	June 2009
Commission Decision on Scoping Information Document	Commission	July 2009
Submission of EIS	AECL	January 2010
Review of EIS by Federal and Responsible Authorities	CNSC	January 2010
Submission of Revised EIS	AECL	May 2010
Preparation of draft EA Screening Report	CNSC	May 2010
Public Review of EA Screening Report	CNSC	June 2010
Review of EA Screening Report by Federal and Responsible Authorities	CNSC	June 2010
Finalize EA Screening Report	CNSC	July 2010
Commission Decision on EA Screening Report	Commission	July 2010

2.0 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

2.1 Scope of the Project

In establishing the scope of a project for a screening environmental assessment under the CEAA, the physical works (e.g., facilities) that are involved in the proposal and any specific undertakings that will be carried out in relation to those physical works must be determined.

The physical works for this proposal are the NRU Reactor Building, the Molybdenum Production Facility, waste management infrastructure, the proposed Light Water Detritiation Facility, and the proposed Fissile Waste Storage System.

The undertakings in relation to the physical works are as follows:

NRU Reactor Building:

- remediation and modification of the NRU rod bay structure;
- remove from service the active holding tank adjacent to the rod bay;
- construction of external enclosed utilidors;
- consolidation of existing sand fill;
- foundation bedrock drilling and grouting; and
- continue operations until 2021 (including any potential component refurbishment/upgrading/replacement, such as the reactor vessel).

Molybdenum Production Facility:

- improvements and upgrades to the ventilation system (including ductwork inside and outside the facility); and
- connection of the MPF to the active drain system.

Light Water Detritiation Facility:

- site preparation (including excavation, site grading, compaction, paving and construction of foundation);
- construction activities (including the installation of site services, erection of buildings, installation of process equipment and underground piping to connect to the rod bays); and
- operation of the LWDF (e.g., rod bays water treatment and release).

Fissile Waste Storage System:

- site preparation (including grading and excavation);
- excavation for extension of the existing underground stainless steel pipe chase, which provides the interconnections between Mo-99 Cell and Fissile Solution Storage Tank Facility to the new building housing the FWSS and hot cell;

- construction activities (including the installation of two additionally storage tanks, a hot cell, isotope processing, and ancillary systems and equipment); and
- operation of the FWSS.

Waste Management Infrastructure:

- modifications to existing waste management facilities within the existing CRL site; and
- construction and operation of new waste management facilities within the existing CRL site.

2.2 Factors to be Considered in the EA

The scope of the screening environmental assessment under the CEAA must include all the factors identified in paragraphs 16(1) (*a*) to (*d*) of the CEAA. These are:

a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project, and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
b) the significance of the effects identified in a) above;
c) comments from the public that are received in accordance with the CEAA and its regulations; and
d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project.

The CEAA defines an "*environmental effect*" in respect of a project as:

> *(a)* "any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act,
>
> *(b)* any effect of any change referred to in paragraph (*a*) on
>
> (i) health and socio-economic conditions;
> (ii) physical and cultural heritage;
> (iii) the current use of lands and resources for traditional purposes by aboriginal persons; or
> (iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or
>
> *(c)* any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada."

Paragraph 16(1)(*e*) provides for CNSC discretion to require consideration of other matters. The CNSC has determined that the EA must include the need for and purpose of the project (Section 3.3), as well as a preliminary design and implementation plan for a follow-up program (Section 7.0). Additional or more specific factors or issues to address in the EA may be identified during the conduct of the EA.

2.3 Scope of the Factors

Pursuant to section 15 of the CEAA, the CNSC must determine the scope of the factors, or the extent to which the factors in the screening need to be considered in the EA. The scope of factors identifies the geographical, spatial and temporal boundaries of the assessment, conceptually bounded in both time and space.

Both the spatial and temporal boundaries will remain flexible during the assessment to allow the full extent of a likely environmental effect to be considered in the screening. For instance, should the results of modelling demonstrate that there is dispersion of a contaminant that is likely to cause an environmental effect beyond the boundaries identified, it will be taken into account in the assessment.

2.3.1 Spatial Boundaries of the Assessment

The geographic study areas for this screening will encompass the areas of the environment that can be reasonably expected to be affected by the project, or which may be relevant to the assessment of cumulative environmental effect, including the people; wildlife and non-human biota; land; water; air and other aspects of the natural and human environment. Study boundaries will be defined taking into account ecological, technical and social/political considerations.

The spatial (study area) boundaries of this assessment are as follows:

The Site Study Area: includes all infrastructure and lands where project activities and activities associated with the project take place. The Site Study Area encompasses the developed Area of the CRL site where the NRU Reactor Building, systems and facilities are/will be located; routes used for the transfer of solid and liquid wastes from the developed area to licensed Waste Management Areas; and existing/proposed Waste Management Areas for the storage of solid and liquid waste.

Local Study Area: includes all lands within the CRL site property boundary (a 37 km^2 area) and includes the reach of the Ottawa River along the site boundary.

Regional Study Area: includes the area within a 40 km radius of the CRL site. This area includes the communities of Rolphton, Deep River, Chalk River, Petawawa and Pembroke in Ontario and Fort William and Sheenboro in Pontiac County in Quebec.

3.2 Temporal Boundaries of the Assessment

The temporal boundaries for this assessment must establish over what period of time the project-specific and cumulative effects are to be considered. The initial time frame for the assessment will be the duration of the project; that is, the planned operational life of the

NRU facility through to 2021. Where effects of the project are anticipated to continue beyond the operation of the facility (for example, as a result of environmental contamination from the project), then a time frame appropriate for describing the extent of the longer-term residual effects must be defined.

2.4 Assessment of Public Participation

In accordance with section 18(3) of the CEAA, the CNSC is responsible for determining the need for and level of public participation of a project. Based on the public participation criteria and rationale (Appendix A), AECL's NRU Reactor Long-term Management Project was determined to require public participation.

The CNSC will perform the following public participation activities:

- post notice of commencement of EA on both the CNSC website and the CEAR within 2 weeks of a determination;
- post notice of availability of Scoping Information Document, for information only; and
- post notice of availability of draft EA Screening Report and allow a 20-day review and comment period, anticipated for June 2010.

2.5 Aboriginal Participation

Aboriginal groups who may have protected rights that are adversely affected by the project will be provided with project specific information. The CNSC will engage with any interested Aboriginal group to share information and address concerns. The EA process is flexible, and intended to ensure that all concerns raised will be addressed. Interested Aboriginal groups will also be able to comment on the Screening Report during the review period which is anticipated for June 2010.

The following Aboriginal groups and entities were identified by the CNSC and provided project specific information:

- Algonquins of Pikwàkanagàn;
- Ottawa Regional Métis Council; and
- Algonquin Consultation office.

2.6 Determining the Type of Screening EA Process

Criteria are used to determine whether screening EAs at the CNSC can follow a simple or complex track; depending on the potential risk that the proposal would have on the environment and the anticipated level of public interest. Taking into consideration the criteria and supporting rationale (Appendix B), the NRU Reactor Long-term Management Project was determined to follow the "simple" screening track.

3.0 PROJECT-SPECIFIC INFORMATION REQUIREMENTS

3.1 Project Overview and Schedule

The EIS must identify and characterize the undertakings and the activities in relation to those undertakings that are required for the proposed project. An overview of the proposed project, together with a proposed schedule for all phases of the project is required.

3.2 Proponent Organization

The EIS will include a detailed description of AECL, including its ownership, organization and structure. This description will also include the relevant organizational and management structure, and staff qualification requirements with emphasis on safety and environmental management programs.

3.3 Need for and Purpose of the Project

The "need for" the project is defined as the problem or opportunity that the proposed project is intending to solve or satisfy. That is, "need for" establishes the fundamental justification or rationale for the project. The "purpose of" the project is defined as what is to be achieved by carrying out the project.

The screening report will provide a clear and comprehensive statement of the purpose of, and need for, the project.

3.4 Physical Components and Activities of the Project

Those specific components and activities which have the potential to interact with, and thus result in a likely change or disruption to, the surrounding environment, during site preparation; construction (installation or modification of any equipment, structures or processes); normal operations; and malfunctions and accidents are to be identified and characterized.

The description of the physical components and activities of the project will refer to, and elaborate on, the items identified in the scope of the project (see section 2.1).

3.4.1 Site Preparation

Site preparation activities for the construction of the Light Water Detritiation Facility, Fissile Waste Storage System, waste management facilities and external enclosed utilidors should be provided and include the following:

- excavation (including the activities associated with remediation of contaminated soil and groundwater, dewatering, and potential effects of excavation activities on local groundwater contaminant plumes, if required);

- Site grading, compaction and paving; and
- construction of foundations.

3.4.2 Construction, Modifications and Normal Operations

The following information should be provided in summary form:

- the location, on the licensed site, of construction and modifications required to implement AECL's proposal (including relevant figures, if appropriate);
- the basic configuration, layout, shape, size, design and operation of the facilities components, and supporting infrastructure;
- the toxicity and characteristics of any chemicals, additives or speciality construction materials required (including their designation under the *Canadian Environmental Protection Act* (1999));
- the key components of the facilities, including, but not limited to the discussion of component age and wear issues, relevant to environmental performance and safety;
- the key components of the facilities and their physical security systems (excluding prescribed information) that are relevant to management of malfunctions and accidents that may occur during the project activities;
- a description of scheduled maintenance procedures, including maintenance shutdowns and preventative maintenance;
- the inventories of nuclear substances and other hazardous materials to be stored at the facility, including locations and storage methods;
- a description of normal operations for the LWDF, FWSS, and any new waste management infrastructure;
- the activities associated with the operation of the NRU Reactor, such as reactor fuelling and defueling, maintenance (including any potential component refurbishment/replacement, such as the reactor vessel) and waste management;
- the predicted doses to workers and the public involved with the operation and associated activities that are within the scope of this project; and
- the sources and characteristics of any potential risks (including physical, chemical and radiological risks) to workers, the public or the environment from the project.

3.4.3 Generation of Waste

Information should be provided concerning the generation of waste as a result of the proposed project, including:

- the sources, types and quantities of radioactive, hazardous and non-hazardous waste predicted to be generated by the project (e.g., contaminated soil excavated during site preparation, refurbishment/replacement of NRU Reactor components, and waste created during normal and accident conditions);

- the on-site processes for the collection, handling, transport, storage, treatment and disposal of radioactive, hazardous and non-hazardous wastes to be generated by the project (e.g., handling and transportation of contaminated soil to the Waste Management Area; and solid/liquid waste generated from the MPF which is transported and stored at the FWSS);
- the predicted sources, quantities and points of release from the project of emissions and effluents containing nuclear substances and hazardous materials;
- a description of any controls used to minimize the amount of waste produced and/or released to the environment; and
- A review of any existing waste management systems and descriptions of any proposed waste management systems including design, construction and operation to ensure that waste management and/or disposal activities proposed for this project are compatible with known or potential future plans associated with this project and the CRL site.

3.4.4 Potential Project Related Emissions to the Environment

Characteristics of the project that could pose a risk to people and the environment should be included, and consist of the following information:

- the source and characteristics of drinking water for on-site workers and local residents;
- the predicted doses to workers involved with the associated operations and activities that are within the scope of this project (e.g., excavation and transport of contaminated soil);
- the sources and characteristics of any potential risks (including physical, chemical and radiological risks) to workers, the public or the environment from the project (e.g., potential risks associated with construction activities, potential contamination of country food and tritium released during transfer and transport activities);
- key operational procedures relevant to protection of workers, the public and the environment relating to the project;
- results of past monitoring (i.e., effluents, groundwater and environmental) at the NRU Reactor Building and/or for the CRL site as relevant to establishing a pre-project environmental baseline and making future predictions of environmental performance. Limitations in the coverage and/or accuracy of past monitoring information should be discussed;
- the predictions of future emissions and effluents from the project under normal operating conditions (e.g., discharge of rod bays water from the LWDF and release of noble gases from the FWSS);
- the sources and characteristics of any fire hazards; and
- the sources and characteristics of any noise, odour, dust and other likely nuisance effects from the project.

3.4.5 Potential Malfunctions and Accidents

The discussion and evaluation of potential malfunctions and accidents should include the following:

- an identification and discussion of any past abnormal operations, accidents and spills to the extent that they are relevant to the current assessment for the purpose of identifying accident and malfunction scenarios;
- a description of specific malfunction and accident events that have a reasonable probability of occurring during the life of the project, including an explanation of how these events were identified, and any modeling that was performed, for the purpose of this environmental assessment;
- an assessment of criticality safety during fuel storage and handling procedures in the NRU Reactor Building to prevent an inadvertent criticality event from occurring;
- the source, quantity, mechanism, pathway, rate, form and characteristics of contaminants and other materials (physical, chemical and radiological) likely to be released to the surrounding environment during the postulated malfunctions and accidents;
- an assessment of potential health and environmental effects resulting from the release of contamination during any postulated malfunction or accident; and
- any contingency, clean-up or restoration work in the surrounding environment that would be required during, or immediately following, the postulated malfunction and accident scenarios.

3.4.6 Decommissioning

Preliminary decommissioning plans for the FWSS, LWDF, and all other structures will be included in the assessment. The existing preliminary decommissioning plans for AECL's NRU Reactor Building should be revised according to the proposed modifications to the facility. Decommissioning plans will include an overview of the principal hazards and protection strategies envisioned for decommissioning. A description of the revisions and new decommissioning plans and how they would affect the end-state objectives for decommissioning; decontamination, disassembly and remediation, as well as the approximate quantities and types of waste generated is required.

3.5 Description of the Existing Environment

A description of the existing environment is needed to determine the likely interactions between the project and the surrounding environment and, conversely, between the environment and the project. Both the biophysical environment and the socio-economic (human, cultural) environment are to be considered.

This section of the EIS must provide a baseline description of the environment, including the components of the existing environment and environmental processes, their interrelations and interactions as well as the variability in these components, processes

and interactions over time scales appropriate to this EIS. The proponent's description of the existing environment must be in sufficient detail to permit the identification, assessment and determination of the significance of potentially adverse environmental effects that may be caused by the project, to adequately identify and characterize the beneficial effects of the project, and provide the data necessary to enable effective testing of predictions during the follow-up program.

The baseline description should include results from studies done prior to any physical disruption of the environment due to initial site clearing activities planned as part of the site preparation phase. The baseline description must include characterization of environmental conditions resulting from historical and present activities in the local and regional study area (see Section 5 Assessment of Cumulative Effects). An inventory of radiological and non-radiological contaminants at the CRL site should be included. The EIS must compare baseline data with applicable federal, provincial, municipal or other legislative requirements, standards, guidelines or objectives (e.g., Reference 3 and 4).

An initial screening of likely project-environment interactions will be used in identifying the relevant components of the environment that need to be described. In general, the environmental components that are typically described in the various study areas may include, but are not necessarily limited to:

Atmospheric Environment:

- radioactivity in the atmospheric environment;
- air quality (physical and chemical);
- noise / dust; and
- greenhouse gas emissions.

Surface Water Environment:

- radioactivity in surface water;
- surface water quality (physical and chemical);
- surface hydrology (flow / level); and
- drainage alteration.

Aquatic Environment:

- radioactivity in aquatic environment;
- aquatic ecology; and
- aquatic habitat.

Groundwater Environment:

- radioactivity in groundwater
- groundwater quality (physical and chemical); and
- hydrogeology.

Terrestrial Environment:

- radioactivity in terrestrial environment;
- vegetation communities and species;

- terrestrial ecology;
- wildlife habitat;
- soil quality (chemical and physical) ;
- physiography and topography;
- geology; and
- seismic activity.

The description of the human components of the above environment could include, but should not necessarily be limited to:

Socio-economic Conditions:

- population;
- relevant demographic characteristics;
- proximity to nearest community;
- economic base;
- community infrastructure and services;
- regional health services and public health infrastructure; and
- site health and safety training.

Land and Resource Use:

- use of lands and resources for traditional purposes by aboriginal persons;
- other uses (e.g., forestry, hunting, trapping);
- renewable and non-renewable resource use; and
- existing and planned use of water resources (e.g., drinking or recreation).

Cultural Heritage:

- archaeology; and
- landscape and visual setting.

Health and Safety:

- radiation dose to general public;
- radiation dose to workers;
- radiation dose to the critical group;
- chemical exposure to public;
- chemical exposure to workers; and
- physical hazards.

The required level of detail in the description of the existing environment will be less where the potential interactions between the project and various components of the environment are weak or remote in time and/or space.

Existing information, including traditional knowledge, may be used to describe the environment. Where that information is significantly lacking, additional research and field studies may be required to complete the screening assessment. CNSC staff will review any work done by AECL to fill identified gaps in information as progress is being made.

3.6 Criteria of Assessment

Constituents of potential concern (COPCs) are the contaminants that could potentially be released to the environment as a result of the proposed project, and may cause a change to one or more of the environmental components. Any relevant COPCs must be identified in the description of the existing environment.

To assess effects on the biophysical environment, on human health and on socio-economics, it is necessary to identify the criteria against which the effects of constituents of potential concern will be measured. These criteria are collectively called the criteria of assessment. Several types of criteria may be used including published guidelines that are intended to be protective of all species and toxicity reference values that are species specific and used to assess the risks of potential effects. Where toxicity reference values are used, preference is given to peer-reviewed sources.

3.7 Valued Ecosystem Components

The assessment of environmental effects on the biophysical environment focuses on valued ecosystem components (VECs). VECs are environmental attributes or components identified as having a legal, scientific, cultural, economic or aesthetic value. The term "VEC" is sometimes applied to all components of the environment including air, land, soil, water, aquatic and terrestrial plants and animals and people.

VECs in the existing environment will be identified and used as specific assessment end-points. Measurement end-points will be identified, as appropriate.

Explicit calculation of radiation doses to non-human biota should be performed with recognized approaches and software tools. Details of transfer parameters and their validation for site conditions should be well-documented. Site-specific data, and/or authoritative data sources, should be used to support model structure and parameter choices. Particular attention should be paid to the choice of food chain transfer factors for VECs, which can vary by orders of magnitude in different environments for different species.

Use of any software tool is acceptable if it can address risks to VECs explicitly or by reasonable analogy. If the approach of Environment Canada & Health Canada (Reference 5) is not used, the model structure and implementation should be described in detail. It is not acceptable to simply refer to a software handbook. A few representative worked examples of simple dose calculations starting with media and/or food concentrations should be presented, regardless of the approach taken.

4.0 ASSESSMENT AND MITIGATION OF ENVIRONMENTAL EFFECTS

4.1 Description of Assessment Methods

The consideration of environmental effects in the screening should be done in a systematic and traceable manner. The assessment methodology will be summarized in the screening report. The results of the assessment process should be clearly documented using summary matrices and tabular summaries where appropriate.

In describing methods, the proponent must document how it used scientific, engineering, traditional and other knowledge to reach its conclusions. Assumptions must be clearly identified and justified. All data, models and studies must be documented such that the analyses are transparent and reproducible. All data collection methods must be specified. The uncertainty, reliability and sensitivity of models used to reach conclusions must be indicated. The sections in the EIS regarding existing environment and potential adverse environmental effects predictions and assessment must be prepared using best available information and methods, to the highest standards in the relevant subject area. All conclusions must be substantiated.

In preparing the EIS, the proponent is encouraged to make use of existing information relevant to the project (e.g., Reference 6). When relying on existing information to meet the requirements of various sections of the EIS guidelines, the proponent must either include the information directly in the EIS or provide clear direction (e.g., through cross-referencing) to where the information can be obtained. When relying on existing information, the proponent must also comment on how representative the data are, clearly separate factual lines of evidence from inference, and state any limitations on the inferences or conclusions that can be drawn from them

4.2 Identifying Project-Environment Interactions

The initial stage of the assessment requires the identification of project activities that may interact with the biophysical environment or socio-economic environment during project implementation and during relevant malfunctions and accidents. The identification of potential interactions is performed using a *Project-Environment Interactions Matrix* (Appendix C). Those interactions that could adversely interact with the environment will be identified through the EA process. The assessment of environmental effects would then involve predicting and evaluating the likely implications of these project activities to determine which interactions have the potential for likely adverse effects.

A preliminary table of project-environment interactions is provided in Appendix C. This matrix illustrates where the project may potentially interact with the environment. The development of this matrix is based on CNSC staff experience with the site, experience with assessments of similar projects, and knowledge of the project description.

It is expected that AECL will update this table and use it to form the basis of assessment.

Information on the pathway that a potential contaminant may take to get to a specific habitat should be provided in a conceptual site model diagram that represents cause-effect pathways so risk can be calculated (reference 7 and 8).

4.3 Identifying Likely Changes to the Environment

The second step in the assessment is to describe the resulting changes that likely would occur to the components of the environment and VECs as a result of the identified interactions with the project.

Identified changes in socio-economic conditions and various aspects of culture, health, heritage, archaeology and traditional land and resource use should be limited to those that are likely to result from the predicted changes that the project is likely to cause to the environment.

4.4 Determining Likely Residual Adverse Effects

The third step in the assessment is to identify and describe mitigation measures that may be applied to each likely adverse effects (or sequence of effects), and that are technically and economically feasible. The proponent is expected to take all reasonable precautions to protect the environment. Hence, all reasonable means (e.g., best available technology economically achievable and keeping radiation doses as low as reasonably achievable) are expected to be used to eliminate or mitigate adverse environmental effects.

Mitigation strategies should reflect avoidance, precautionary and preventive principles; that is, emphasis should be placed on tempering or preventing the cause or source of an effect, or sequence of effects, before addressing how to attenuate, reverse or compensate for an effect once it occurs. The proponent shall consider the guiding principles set out in the *Framework for the Application of Precaution in Science-based Decision Making About Risk* (Reference 9).

Where the prevention of effects cannot be assured, or the effectiveness of preventive mitigation measures is uncertain, further mitigation measures in the form of contingency responses, including emergency response plans, will be described and considered through the follow-up program (Section 7.0).

Those effects to the environment that would remain after the implementation of mitigation measures should be identified as residual effects. Any residual effects identified should be assessed as to their significance.

The EIS must identify the criteria used to assign significance ratings to any predicted adverse effects. The EIS must contain a detailed analysis of the significance of the potential residual adverse environmental effects it predicts. It must contain clear and sufficient information to enable the CNSC and the public to understand and review the proponent's judgment of the significance of effects. The proponent must define the terms used to describe the level of significance.

4.5 Assessment of Effects of the Environment on the Project

The assessment must also take into account how the environment could adversely affect the project; for example, from severe weather or seismic events. The assessment must also take into account any potential effects of climate change on the project, including an assessment of whether the project might be sensitive to changes in climate conditions during its life span. Guidance can be found on the Canadian Environment Assessment Agency website (Reference 10).

This part of the assessment will be conducted in a step-wise fashion, similar to that described for the foregoing assessment of the project effects. The possible important interactions between the natural hazards and the project will be first identified, followed by an assessment of the effects of those interactions, the available additional mitigation measures, and the significance of any remaining likely adverse environmental effects.

5.0 ASSESSMENT OF CUMULATIVE EFFECTS

The effects of the project must be considered together with those of other projects and activities that have been, or will be carried out, and for which the effects are expected to *overlap* with those of the project (i.e., overlap in same geographic area and time). These are referred to as *cumulative environmental effects*. For example, the assessment of cumulative effects should include: cooling water system effects, contaminated water and sediment, wetlands and on-site lakes next to waste management areas (e.g., Perch Lake). The effects of multiple stressors (e.g., radiological, non-radiological, temperature) on receptors should also be considered.

An identification of the specific projects and activities considered for the cumulative effects assessment will be included in the screening report. Emphasis should be placed on those projects that have occurred or are occurring and on future projects that are either 'certain' to proceed or are reasonably foreseeable.

The information available to assess the environmental effects from other projects can be expected to be more conceptual and less detailed as those effects become more remote in distance and time to the project, or where information about another project or activity is not available. The consideration of cumulative environmental effects may therefore be at a more general level of detail than that considered in the assessment of the direct project-environment interactions.

Where potentially significant adverse cumulative effects are identified, additional mitigation measures may be necessary.

6.0 SIGNIFICANCE OF THE RESIDUAL EFFECTS

The preceding steps in the screening will consider the significance of the environmental effects of the project on the environment; of the natural hazards on the project; and of other projects and activities that could cause cumulative effects.

The criteria for judging and describing the significance of the residual (post-mitigation) effects will include the following categories: magnitude, duration, frequency, timing, and probability of occurrence, ecological and social context, geographic extent, and degree of reversibility. Specific assessment criteria proposed in the EA methodology for this project will be submitted to CNSC staff in the early phases of the EA study for review and acceptance. Existing regulatory and industry standards and guidelines are relevant as points of reference for judging significance. However, professional expertise and judgement should also be applied in judging the significance of any effect. All applicable federal and provincial laws must be respected.

The EIS must clearly explain the method and definitions used to describe the level of the adverse (e.g., low, medium, high) for each of the above categories and how these levels were combined to produce an overall conclusion on the significance of adverse effects for each VEC. This method must be transparent and reproducible and should clearly discriminate between sources in the published literature and professional judgment.

The analysis must be documented in a manner that readily enables conclusions on the significance of the environmental effects to be drawn. The CNSC, as the responsible authority for the EA project, must document in the screening report a conclusion, taking into account the mitigation measures, as to whether the project is likely to cause significant adverse environmental effects.

7.0 FOLLOW-UP PROGRAM

In general, the purpose of a follow-up program is to:

- verify predictions of environmental effects identified in the environmental assessment;
- determine the effectiveness of mitigation measures in order to modify or implement new measures where required; and
- support the implementation of adaptive management measures to address previously unanticipated adverse environmental effects.

A preliminary design and implementation plan for the follow-up program will be included in the screening report. This would include a table that provides the following:

- the purpose of each element of the follow-up program (i.e., to verify predictions, or to ensure mitigation measures are effective);
- what would be monitored;
- the duration of monitoring;

- the frequency and location of monitoring;
- monitoring objective in relation to the specific EA finding, assumption or mitigation to be verified; and
- the responsible department that would receive the information and determine a course of action, if required.

The follow-up program plan must be described in the EIS in sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), confirm environmental assessment assumptions and confirm the effectiveness of mitigation.

The CNSC licensing and compliance program will be used as the mechanism for ensuring the final design and implementation of any follow-up program and the reporting of program results.

8.0 REFERENCES

1. AECL Letter, G. Gerestein (AECL) to M. Santini (CNSC), "Revised Document – Long Term Operation of the NRU in Support of Isotope Supply: Project Description for Determination of Environmental Assessment Requirements", June 29, 2009. e-DOC: 3397678.
2. Joint CNSC-AECL Document, "Protocol for National Research Universal Licensing Activities", July 15, 2008. e-DOC: 3259232.
3. Canadian Council of Ministers of the Environment 2009. Canadian Environmental Quality Guidelines. http://ceqg-rcqe.ccme.ca/
4. Ontario Ministry of the Environment 2009. Forms, Manuals and Guidelines. http://www.ene.gov.on.ca/en/publications/forms/index.php
5. Environment Canada & Health Canada (2003) *Priority Substances List 2 Assessment Report, Releases of Radionuclides from Nuclear Facilities (Impact on Non-human Biota)*, Environment Canada and Health Canada, Ottawa, Canada – e-DOC: 3397890.
6. AECL Letter, M. Klukas (AECL) to K. Francis (CNSC), "Chalk River Laboratories: A Description of the Environmental Baseline for Environmental Assessments", July 2007, e-DOC: 3069925.
7. Canadian Council of Ministers of the Environment (CCME) 1996, *A Framework for Ecological Risk Assessment: General Guidance*, Canadian Council of Ministers of the Environment (CCME), The National Contaminated Sites Remediation Program, Report PN 1195 e-DOC 3397684.
8. Canadian Council of Ministers of the Environment (CCME) 1997, *a Framework for Ecological Risk Assessment: Technical Appendices*, Canadian Council of Ministers of the Environment (CCME), the National Contaminated Sites Remediation Program, Report PN1274 - e-DOC: 3397691.

9. Canadian Privy Council Office. "A Framework for the Application of Precaution in Science-based Decision Making about Risk". ISBN 0-662-67486-3 Cat. no. CP22-70/2003 – e-DOC: 3397689.
10. The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=A41F45C5-1

APPENDIX A. ASSESSMENT OF PUBLIC PARTICIPATION

Evaluation of Criteria

Assessment Criteria	None	Low	Moderate	High
1. There is an indication of existing or likely public interest in : a. the type of project b. the location of the project or c. the ways the project might affect the community.				☑
2. The stakeholders who may be interested have a history of being involved.			☑	
3. The project is likely to generate conflict between environmental and social or economic values of concern to the public	☑			
4. The project could be perceived as having the potential for significant adverse environmental effects (including cumulative environmental effects and effects of malfunctions and accidents).	☑			
5. There is potential to learn from community knowledge or Aboriginal traditional knowledge.		☑		
6. The direct and indirect environmental effects of the project and their significance are uncertain.	☑			
7. The project has not been subject to other public participation processes of appropriate scope and coverage that would meet CNSC objectives.		☑		

Count number of check marks in each column	3	2	1	1
Multiply by:	x 0	x 1	x 2	x 3
Total for each column is:	0	2	2	3
Add totals for an overall score of:	7			

Rationale for determination

Criterion 1.

a. An EA Screening Report was completed for a similar project type in April 2005, the continued operation of the NRU Reactor until 2012. The Long-term Management Project will include the continued operation until 2021, and supporting facilities (i.e. FWSS, LWDF and waste storage facilities). The public was engaged throughout the previous process; therefore, the CNSC is aware of existing and continuing public interest.

The NRU Reactor is used for nuclear power development, materials research and isotope production. Therefore, projects relating to the operation of the NRU

Reactor generate a high level of public interest. b. The CNSC is aware of existing public interest concerning current and proposed activities at the CRL site. c. The project is not anticipated to negatively affect the community. The previous EA determined no effects were expected on the socio-economic environment.
Criterion 2. Local stakeholders were involved in the previous EA and submitted comments on both the EA Guidelines and the EA Screening Report. However, there were a limited number of comments received for both documents, and all concerns raised within the scope of the project were addressed. The CNSC received four comments from Sierra Club and seven comments from the Concerned Citizens of Renfrew County on the previous EA Guidelines. The EA Screening Report received six comments from the Concerned Citizens of Renfrew County, one from Greenpeace and one from a local citizen.
Criterion 3. During the previous EA, the public was consulted on the Valued Ecosystem Components (VECs), which included the socio-economic environment. The activities associated with the current proposed project will be conducted on-site in a manner that is not anticipated to have an effect on the socio-economic VECs previously identified.
Criterion 4. The previous EA did not indicate that the public perceived the continued operation of the NRU Reactor as having the potential to cause significant adverse environmental effects. At the time of the assessment no cumulative environmental effects were identified. During the later part of 2008 and also in February and May 2009, some heavy water leaks at NRU resulted in increased public interest. Although there were no health risks to the public and the environment from these events, the CNSC committed to a wider public disclosure of information. As a result, the CNSC is working towards increasing public awareness and clarifying any misconceptions in regards to the continued operation of the NRU Reactor. The Long-term Management Project will reduce and/or eliminate any possibility of future impacts.
Criterion 5. There is no indication of relevant traditional knowledge at this time. However, local communities were involved in the previous EA; therefore there may be a potential for community knowledge.

Criterion 6. Based on AECL's project description and the previous EA, the environmental impacts, as well as likely mitigation to be required are well understood. CNSC knowledge of the project components and the direct and indirect environmental effects from this project are well characterized and mitigated. The continued operation of the NRU Reactor will provide no new significant environmental effects, as there are no changes to the current operation.
Criterion 7. The new EA contains some activities that are outside the scope of the previous EA (e.g., construction of the LWDF, FWSS and waste management infrastructure). Although AECL actively engages the public, this would not completely meet the CNSC objectives. This project will be subject to a CNSC project-specific public participation process.

As a result of the scan above, is public participation appropriate in the circumstances of this screening-level EA?

Yes	☑	or	No	

If yes, indicate the level of participation required, based on the tabulated score.

None 0 to 2		Low 3 to 7	☑	Moderate 8 to 14		High 15 to 21	

APPENDIX B. DETERMINATION OF THE TYPE OF SCREENING

Evaluation of Criteria

	Criteria Evaluation Questions for Simple Screenings	Yes/True	Uncertain	No/False
1.	The site is well characterized, as are its programs.	☑		
2.	The proposed project is related to an existing licensed facility.	☑		
3.	The proposed project represents an incremental change to the overall facility.	☑		
4.	The environmental performance of the existing licensed activities meets CNSC expectations.	☑		
5.	The proposed project is based on technology that is known to the proponent and CNSC staff.	☑		
6.	The proposed project would only require mitigation measures with which the proponent has a demonstrated familiarity, and/or that are considered standard technology within the industry.	☑		
7.	The proposed project likely does not introduce project-environment interactions that cannot be mitigated with standard or proven technology.	☑		
8.	Based on potential project-environment interactions, the proposed project is not likely to pose any significant adverse effects on the health of workers and the public, cumulative effects, or those that may arise as a result of accidents or malfunctions.	☑		

Rationale for determination

1. The site is well characterized and an EA screening report was approved by the Commission for continue operation of the NRU Reactor until 2012 in August 2005. The new facilities will be used for the treatment and storage of waste and emissions; therefore, no changes are proposed to the way the NRU Reactor is currently operated.

2. The proposed project is located on an existing licensed facility.

3. The proposed project consists of activities (i.e., construction and modification) that represent an incremental change to the overall licensed facility.

4. Under the direction of the CNSC, AECL has continued to make adequate provisions for the protection of the environment. In making these provisions, AECL has met CNSC expectations in environmental performance.

5. CNSC staff is familiar with the technology being presented in this project. The CRL site does not currently operate a Light Water Detritiation Facility; however the technology is well characterized within the industry. AECL is familiar with all other project components.

6. AECL is familiar with all mitigation measures required for the continued operation of the NRU Reactor. The mitigation measures for the Light Water Detritiation Facility are considered standard technology within the industry.

7. Any new project-environment interactions are expected to be adequately mitigated with standard and/or proven technology.

8. At this stage of the EA, it appears that this project is not likely to cause significant adverse effects on the health of workers and the public, cumulative effects, or those that may arise as a result of accidents or malfunctions. The EA will identify all potential project-environment interactions and confirm that the project is not likely to cause significant adverse effects.

As a result of the scan above, is a simple screening appropriate in the circumstances?

YES	☑	or	NO	

APPENDIX C. PROJECT-ENVIRONMENT INTERACTIONS MATRIX

Project Works & Activities	Atmospheric Environment		Surface Water Environment		Aquatic Environment		Terrestrial Environment			Geology and Hydrogeology			Radiation & Radioactivity						Health		Visual Setting and Transportation		Socio-Economics					Physical and Cultural Heritage Resources		Aboriginal Interests		
	Air Quality	Noise	Water Quality and Quantity	Sediment Quality and Quantity	Aquatic Habitat	Aquatic Biota	Vegetation Communities and Species	Wildlife Habitat	Wildlife Communities and Species	Soil Quality	Groundwater Quality	Groundwater Quantity	Atmospheric Environment	Hydrology, Surface Water Quality and Aquatic Environment	Terrestrial Environment	Hydrogeology Environment	Members of the Public	Project Workers	Humans	Non-human Biota	Landscape and Visual Setting	Transportation	Population and Economic Base	Land Use	Community Infrastructure and Services	Municipal Finance and Administration	Residents and Communities	Natural Heritage Resources	Cultural Heritage Resources	Aboriginal Communities	Traditional Land and Resource Use	Cultural and Heritage Resources
Site Preparation Phase																																
Site preparation, excavation and grading	•	•	•	•		•	•		•	•	•	•	•		•	•		•	•	•		•					•	•			
Handling of soil during excavation activities	•								•				•				•	•	•			•										
Construction and Modification Phase																																
Construction of external enclosed utilidor for NRU Rod Bay	•	•														•		•	•													
Repositioning and upgrading of existing pipelines and services for NRU Rod Bay Encapsulation	•	•								•	•	•	•		•		•	•	•													
Internal sand fill consolidation for NRU Rod Bay	•	•								•	•	•							•													
Sealing of porous bedrock formations or fractures for NRU Rod Bay	•	•								•	•	•							•													
Drilling of secondary and tertiary boreholes for NRU Rod Bay	•	•								•	•	•							•													
Construction of LWDF	•	•																	•													
Construction of FWSS facility	•	•																•	•													
Replacement of MPF ventilation system	•	•											•			•	•	•	•	•												
Connection of MPF to active drain system	•	•								•	•	•		•				•	•													
Management of conventional construction waste									•										•			•				•						
Operations and Maintenance Phase																																
Operation of LWDF	•		•			•							•	•	•		•	•	•	•	•					•	•					
Operation of FWSS and associated processes and functions	•					•							•	•	•		•	•	•	•	•					•	•					
Continued operation of MPF													•	•	•		•	•	•	•						•	•					
Operation of the NRU Rod Bay utilidor																		•	•													
Continued operation of the NRU Reactor	•		•	•		•							•	•	•		•	•	•	•						•	•					
Ongoing waste management													•	•		•	•	•	•	•												